Exhibit ZZ

IN THE UNITED STATES DISTRICT COURT
FOR THE MIDDLE DISTRICT OF NORTH CAROLINA

Case No. 1:23-cv-00878-TDS-JEP

DEMOCRACY NORTH CAROLINA;
NORTH CAROLINA BLACK ALLIANCE;
LEAGUE OF WOMEN VOTERS OF
NORTH CAROLINA,

Plaintiffs,

vs.

ALAN HIRSCH, in his official capacity as
CHAIR OF THE STATE BOARD OF
ELECTIONS; JEFF CARMON III, in his
official capacity as SECRETARY OF THE
STATE BOARD OF ELECTIONS; STACY
EGGERS IV, in his official capacity as
MEMBER OF THE STATE BOARD OF
ELECTIONS; KEVIN LEWIS, in his official
capacity as MEMBER OF THE STATE
BOARD OF ELECTIONS; SIOBHAN
O'DUFFY MILLEN, in her official capacity
as MEMBER OF THE STATE BOARD OF
ELECTIONS; KAREN BRINSON BELL, in
her official capacity as EXECUTIVE
DIRECTOR OF THE STATE BOARD OF
ELECTIONS; NORTH CAROLINA STATE
BOARD OF ELECTIONS,

Defendants.

EXPERT REBUTTAL REPORT OF DR. KEVIN M. QUINN

March 26, 2025

I. Statement of Inquiry

1. Plaintiffs' counsel has asked me to review the March 5, 2025 Expert Report of Dr. Paul F. White (the "White Report") and to evaluate the empirical claims in that report.

2. The primary claim in the White Report is that "[F]or the vast majority of the elections at the county level, and across all of North Carolina, from a statistical standpoint the second mailing had no significant effect on the denial rates of younger registrants" (p. 1). As I detail below, the evidence presented in the White Report does not support such a conclusion.

3. Indeed, nothing in the White Report causes me to revise the finding in my March 5, 2025 Expert Report and March 20, 2025 supplement to that report that SB 747 will likely result in disproportionate numbers of failed voter registration verifications for youth registrants—both relative to how those youth registrants would have fared in the pre-SB-747 two-mailer verification process and compared to how other age groups will likely fare under SB 747.

II. Summary of Conclusions

4. Dr. White's tests of independence of age and registration denial status among those same-day registrants who were sent a second mailer does not provide any direct evidence as to the causal effect of SB 747 relative to a baseline of another statutory regime governing address verification by mail of same-day registration.

5. Accordingly, Dr. White's claim that "[F]or the vast majority of the elections at the county level, and across all of North Carolina, from a statistical standpoint the second mailing had no significant effect on the denial rates of younger registrants" (p. 1) is not supported by the analysis in the White Report.

6. Dr. White's categorization of some results as being "adverse to" younger registrants or older registrants is, in some cases, misleading.

7. A more subtle, but ultimately more important, shortcoming of Dr. White's analysis is that he explicitly assumes that if denial rates after the second mailer are statistically indistinguishable between younger and older registrants, then there is no disparate impact on younger registrants. This is simply incorrect.

8. A correct interpretation of Dr. White's data shows that youth same-day registrants were more than 5 times more likely to rely on the second mailer for verification than were older registrants. The elimination of the possibility of verification on a second mailer under SB 747 would thus have a disparate impact on youth registrants.

9. Dr. White restricts the data analysis to a subset of county-elections that is not statistically necessary.

10. The results in the White Report, when properly interpreted, are consistent with the main points in my March 5, 2025 Expert Report and my March 20, 2025 Supplemental Expert Report.

11. Inspection of Table 3 in the White Report reveals that 2,797 of 6,521 same-day registrants (as categorized by Dr. White) who were verified on a second mailer were 26 years old or younger (42.89%).[1] This is very similar to what I wrote in paragraph 44 of my Supplemental Expert Report: "Individuals under the age of 26 are the largest group of voters who had a second mailer sent or who rely on post-change-of-address forwarding. 44.0% of the individuals who were verified on a second mailer were youth voters… If the second mailer were not available, it is almost certain that these individuals would have failed verification and thus had their registration denied."

---

[1] 3,071 registrants in the youth pool minus 274 denied equals 2,797 verified youth same-day registrants. 4,085 registrants in the older pool minus 361 denied equals 3,724 verified older same-day registrant. 2,797 plus 3,724 equals 6,521 total verified same-day registrants.

III. The White Report

12. In this section, I briefly summarize the analysis in the White Report in Subsection A. In Subsection B, I critique of some of the analysis decisions made in the White Report and assess the empirical claims made by Dr. White.

A. Summary of Dr. White's Analysis and Results

13. Dr. White builds the data set for his analysis by combining data on verifications and denials, keeping only records that he deems "SDR-relevant", further keeping only records where the update date is between the start of the early voting period for a given election and two days after the date of canvass for that election, further keeping only records that "hav[e] a status of "1ST VERIFICATION(PRIOR TO MAILING)" or "1ST VERIFICATION PENDING" during the early voting period."[2] Dr. White categorizes these registrants as "SDR registrants".[3] Dr. White then subsets these data to those records from registrants who were 18 years of age or older in the election in question. Finally, Dr. White restricts his attention to only those registrants who were sent a second mailer. This yields 7,156 registrants across 10 elections from 2016 to 2024.

14. The centerpiece of Dr. White's report is the analysis of these data represented as a number of 2×2 tables (for the election-county analyses) or $2 \times 2 \times K$ tables (for analyses aggregated over elections, counties, or both). One margin of these tables is a dichotomous indicator of the age of the registrant (either 18-25 vs. 26+ or 18-29 vs. 30+). The other margin is whether the registrant who was sent a second mailer was denied or not.

15. For example, using the information in Table 4 of the White Report, the 2×2 table for Bladen County in the November 6, 2018 general election (using 26 as the age cutoff) is:

---

[2] White Report, p. 6.
[3] *Id.*

	Not Denied	Denied	TOTAL
Age 18-25	1	4	5
Age 26+	7	1	8
TOTAL	8	5	13

Table 1. Registration Denial Status by Age Among Registrants Sent Second Mailer (Bladen County, November 6, 2018 General Election). From Table 4 of the White Report (p. 14).

16. Dr. White analyzes the 2×2 election-county tables such as this with a statistical test known as Fisher's exact test. The null hypothesis that is tested by Fisher's exact test is that denial status is statistically independent of the dichotomous age indicator (18-25 vs. 26+ in this example). Put more simply, the null hypothesis of independence can be thought of as the 18-25-year-olds in a table being denied at the same rate as the 26+-year-olds in the table. Further, as Fisher's exact test assumes the margin totals are fixed (i.e. in the example in Table 1 above, there are always 8 registrants not denied, 5 denied, 5 age 18-25, and 8 age 26+), one can also think of the null hypothesis of independence as the 5 denials being randomly assigned to the 13 registrants without respect to age.[4] This is the hypothesis that Dr. White is testing.

17. A rejection of the null hypothesis of independence means that the probability of seeing the observed 2×2 table (or another, more extreme table) is low in a world where the null hypothesis is true, and age and denial status are truly independent.[5] The *p*-value for the Fisher exact test in

---

[4] *See* Petra Buzkova, Thomas Lumley, and Kenneth Rice (2011) "Permutation and Parametric Bootstrap Tests for Gene-Gene and Gene-Environment Interactions," *Annals of Human Genetics*, 75: 36-45, which notes that Fisher's exact test is a type of permutation test.

[5] For the two-tailed alternative hypotheses considered by Dr. White (see p. 11 of the White Report), tables "more extreme" than the observed table are defined to be those tables which are less likely to occur under the null hypothesis than the observed table. *See* Alan Agresti (1990) *Categorical Data Analysis*, New York: Wiley, p. 62.

this case is "the sum of the probabilities of tables no more likely to occur than the observed table."[6]

Dr. White uses the conventional threshold of 0.05 (i.e. 5.0%) to indicate statistical significance which defines what this "low" probability is. If the p-value is less than or equal to 0.05 (the level of the test used by Dr. White), we say the departure from independence in the observed table is statistically significant at the 0.05 level.[7]

18. The p-value for a test of the null hypothesis of independence in Table 1 above using Fisher's exact test is 0.0319. As this p-value is less than 0.05, one rejects the null hypothesis of independence at the 0.05 level. Put another way, Table 1 (or a table with a more extreme departure from independence) would be unlikely to occur if the 5 denials were randomly assigned to the 13 registrants without respect to age.

19. Consider another county-election table from the White Report. Table 2 presents data from Watauga County for the March 15, 2016 primary election. These data appear in Appendix E of the White Report. Dr. White correctly reports the p-value for the test of the null hypothesis of independence to be 1 (100.00% in the White Report). Since 1 is greater than 0.05, we cannot reject the null hypothesis of independence for this table. The data in this table are consistent with the hypothesis that the 4 denials were randomly assigned to the 63 registrants without respect to age.

---

[6] *Id.* p. 62.
[7] *See* Peter J. Bickel and Kjell A. Doksum (2015) *Mathematical Statistics: Basic Ideas and Selected Topics: Volume I*, 2nd Edition, Boca Raton, FL: CRC Press, p. 221.

	Not Denied	Denied	TOTAL
Age 18-25	50	4	54
Age 26+	9	0	9
TOTAL	59	4	63

Table 2. Registration Denial Status by Age Among Registrants Sent Second Mailer (Watauga County, March 15, 2016 Primary Election). From Appendix E of the White Report.

20. For the analyses aggregated over elections, counties, or both, Dr. White uses the Mantel-Haenszel test. This test is similar to Fisher's exact test. The primary difference is that the Mantel-Haenszel test is a test of the null hypothesis of conditional independence between two dichotomous variables (age and registration denial status in Dr. White's report) given a control variable (or variables) broken up into K strata.[8]

21. To gain intuition about the Mantel-Haenszel test, consider Dr. White's results By County Across All Elections (Appendix G of his report) where the control variable is election which is broken up into 10 strata—one for each of the 10 elections considered by Dr. White. Here, when analyzing a particular county, Dr. White is looking at a $2 \times 2 \times 10$ table (dichotomous age $\times$ dichotomous denial status $\times$ 10 elections) which one could also think of as 10 connected 2×2 (dichotomous age $\times$ dichotomous denial status) tables (one for each of the 10 elections in the county). The null hypothesis of conditional independence between age and denial status given election is equivalent to the denials being randomly assigned to registrants in each election without regard to age.

22. That same intuition carries over to Dr. White's other analyses that make use of the Mantel-Haenszel test. The only difference being the control variable (or variables) that define the strata.

___

[8] *See* Agresti, *supra* note 5, pp. 230-34.

In Dr. White's Statewide Results Across Counties and Elections (Appendix D of his report) the control variables are counties and elections. In Dr. White's results By Election Across All Counties (Appendix F of his report) the control variable is county. Again, one can think of the null hypothesis being tested as equivalent to registration denials being randomly assigned to the registrants without respect to age within all strata defined by the control variable(s).

23. Importantly, both Fisher's exact test and the Mantel-Haenszel test condition on the margin totals (the number of youth registrants, older registrants, denials, and no denials) and thus treat the number of youth registrants and older registrants as fixed by design.[9] The hypotheses Dr. White tests are purely about the *relative rates* of denial for youth and older same-day registrants who are sent the second mailer and **are not** hypotheses about the *total numbers* of youth or older same-day registrants who rely on the second mailer for verification. I return to this important point below.

24. Dr. White is not able to reject the null hypothesis of conditional independence between age and denial status given election and county using either the 18-25 or the 18-29 definition of youth voters.[10]

25. Dr. White rejects the null hypothesis of conditional independence between age and denial status given county for 2 of 10 elections using the 18-25 definition of a youth voter, and for 1 of 10 elections using the 18-29 definition of a youth voter.[11]

26. Dr. White rejects the null hypothesis of conditional independence between age and denial status given election for 3 of 64 counties using the 18-25 definition of a youth voter, and for 2 of 65 counties using the 18-29 definition of a youth voter.[12]

---

[9] *See* Agresti, *supra* note 5, p. 60 (for Fisher's exact test) and p. 231 (for the Mantel-Haenszel test).
[10] White Report, Table 8, p. 19.
[11] *Id.*
[12] *Id*.

8

27. Dr. White rejects the null hypothesis of independence between age and denial status for 1 of 150 county-elections using the 18-25 definition of a youth voter, and for 2 of 156 county-elections[13] using the 18-29 definition of a youth voter.[14]

28. The results described in paragraphs 24-27 support a conclusion that, within the data analyzed by Dr. White, dichotomous age is statistically independent of denial status after conditioning on county and election. In other words, the data are consistent with the hypothesis that within a county and election, denials after a second mailer are randomly assigned to registrants without regard to age. All of Dr. White's tests take the number of youth and older registrants as fixed. Thus, his tests do not directly speak to questions about the *total numbers* of youth and older registrants denied or verified after a second mailer. His tests only speak to questions about the *fraction* of youth registrants who are denied relative to the *fraction* of older registrants who are denied.

B. Critique of Analysis Decisions in the White Report and Interpretation of Dr. White's Empirical Claims

29. Dr. White claims to be studying "the potential effects of North Carolina Senate Bill 747 (SB 747) to registration application denials of younger same-day registrants had it taken effect in previous elections."[15]

---

[13] The county-elections do not equal 10 elections × 100 counties = 1000 county-elections (or the 573 county-election combinations with non-zero data) because Dr. White has removed county-elections he deemed not "large and balanced enough for statistical analysis" (White Report, notes 19 and 20). I return to this decision by Dr. White in paragraph 45 of this report.

[14] *Supra* note 10.

[15] White Report, p. 1. *See also* White Report, p. 2 which states "For this report, Resolution Economics was asked to statistically analyze North Carolina's same-day registration (SDR) data to study the potential effects of North Carolina Senate Bill 747 (SB 747) to registration application denials of younger same-day registrants had it taken effect in previous elections."

30. Dr. White's tests of independence of age and registration denial status among those same-day registrants who were sent a second mailer does not provide any direct evidence as to the causal effect of SB 747 relative to a baseline of another statutory regime governing address verification by mail of same-day registration.

31. Dr. White compares denial *rates* among youth registrants to denial *rates* for older registrants within the same pre-SB-747 statutory regime. As the statutory regime is held constant in these comparisons, they do not speak directly to the effect of SB 747 on same-day registration denials for younger registrants.

32. Dr. White describes his results as "adverse to" younger registrants (or older registrants) if the second mailing denial rate for younger registrants (or older registrants) is lower than what would be expected under the null hypothesis of independence between age and denial status (and statistically significant).[16]

33. This focus on relative denial rates across age groups only tells a small part of the story. If second-mailer denial rates are the same across age groups, but a larger fraction of youth registrants rely on the second mailer for verification, then removing the possibility of verification on a second mailer will disproportionately negatively impact youth registrants relative to older registrants. Indeed, as demonstrated immediately below, there can even be situations where youth registrants would be disproportionately negatively impacted by eliminating the possibility of verification on the second mailer even when the second mailer denial rate is significantly higher for youth registrants relative to older registrants. This happens when the number of youth registrants who

---

[16] Dr. White also uses the terminology "benefitted from", "worse off", and "better off" to describe statistically significant differences in denial rates across age groups. *See* White Report, pp. 1, 13-17, and 20.

rely on the second mailer for verification is disproportionately larger than the number of older registrants who rely on the second mailer for verification.

34. Consider Table 3 below. This is constructed from data in Table 6 of the White Report.

	Not Denied	Denied	TOTAL
Age 18-25	210	17	227
Age 26+	152	3	155
TOTAL	362	20	382

Table 3. Registration Denial Status by Age Among Registrants Sent Second Mailer (March 15, 2016 Primary Election, All Counties). From Table 6 of the White Report (p. 16). Dr. White classifies this table as adverse to 26+ year olds.

35. Dr. White categorizes this table as adverse to older registrants (26+ year olds) because younger registrants are denied at a higher rate than older registrants (17/227 = 7.49% to 3/155 = 1.94%) and the null hypothesis of independence is rejected ($p = 0.0356$). However, this categorization misses the point that the majority of registrants who received a second mailer (and thus did not verify on a first mailer) were youth registrants (227/382 = 59.42% were youth registrants). Without a second mailer, all of these registrants would have been denied. Further, 210 youth voters (defined by an eight-year age-bin of 18-25) were verified by the second mailer in this pre-SB-747 statutory regime but would not have been verified if the second mailer was removed (as is the case under SB 747). Compare this to the 152 older voters (defined by an approximately 75-year age-bin of 26+) who were verified by the second mailer in this pre-SB-747 statutory regime but would not have been verified if the second mailer was removed (as is the case under SB 747). 210 of the 362 voters who used the second mailer to verify were youth voters (58.01%).

11

To say that this table is evidence of an adverse impact on older registrants is, at best, very misleading.

36. Admittedly, Table 3 presents a relatively extreme example from one election of how Dr. White's focus on relative denial rates across age groups without considering the number of registrants in each age group can produce misleading conclusions. A more subtle, but ultimately more important, shortcoming of Dr. White's analysis is that he explicitly assumes that if denial rates after the second mailer are statistically indistinguishable between younger and older registrants, then there is no disparate impact on younger registrants. This is simply incorrect.

37. Consider Table 3 in the White Report which reports denials after the second mailer by age group (both 18-25 vs. 26+ and 18-29 vs. 30+) aggregated across all counties and all elections he considers. Dr. White is not able to reject the null hypothesis of independence between age and denial status at the 0.05 level using either 26 or 30 as the age cutoff ($p = 0.1137$ and $p = 0.1013$, respectively). He thus concludes that there is no adverse impact, i.e. neither age group would be made "better off" or "worse off" by eliminating the possibility of verification on the second mailer.

38. This is an incorrect conclusion. Dr. White's own data, when properly interpreted, are consistent with the main points in my March 5, 2025 Expert Report and my March 20, 2025 Supplemental Expert Report.

39. Inspection of Table 3 in the White Report reveals that 2,797 of 6,521 same-day registrants who were verified on a second mailer were 26 years old or younger (42.89%). This is very similar to what I wrote in paragraph 44 of my Supplemental Expert Report: "Individuals under the age of 26 are the largest group of voters who had a second mailer sent or who rely on post-change-of-address forwarding. 44.0% of the individuals who were verified on a second mailer were youth

voters… If the second mailer were not available, it is almost certain that these individuals would have failed verification and thus had their registration denied."

40. To see the disparate impact on youth registrants in Table 3 of the White Report, note that from 2016 to 2024 approximately 12.5% of North Carolina registrants were under 26 years of age.[17] It follows that approximately 87.5% of North Carolina registrants were 26+ years of age during this time period. If we normalize the 2,797 youth same-day registrants who were verified on the second mailer and the 3,724 older same-day registrants who were verified on the second mailer[18] by their age-group's approximate shares of the registered voter population, we see that youth same-day registrants were more than 5 times more likely to rely on the second mailer for verification than were older registrants.[19]

41. While Dr. White does not find significant differences in the denial rates across younger and older registrants who were sent the second mailer when aggregating over all counties and elections he considers, he does find a small number of statistically significant differences when looking at the disaggregated data. That said, proper interpretation of all of the results in the White Report strongly suggests that, within county and election, age and denial status are statistically independent for those registrants who were sent a second mailer. In other words, youth registrants are denied after a second mailer at the same rate as older registrants after adjusting for county and election.

42. To understand why this is the case, consider the following. If one were to test 200 independent true null hypotheses at the $\alpha = 0.05$ level, one would expect a properly calibrated statistical testing procedure to return 10 or fewer significant results ($0.05 \times 200 = 10$). Indeed, this

---

[17] March 5, 2025 Expert Report of Dr. Kevin M. Quinn, Figure 6.
[18] *Supra* note 1.
[19] (2,797 / 12.5) / (3,724 / 87.5) = 5.26.

13

is the definition of the significance level (0.05 in this example).[20] Table 8 of the White Report shows that when using 26 as the age cutoff, 6 of 225 tests of (conditional) independence between age and registration denial status among those sent a second mailer were significant at the 0.05 level (2.66%). Similarly, when using 30 as the age cutoff, 5 of 232 tests of (conditional) independence between age and registration denial status among those sent a second mailer were significant at the 0.05 level (2.16%).

43. While Dr. White's results are consistent with age and registration denial status being (conditionally) independent among those sent a second mailer, this does not imply that youth same-day registrants are impacted by SB 747 the same as older same-day registrants. As noted above, if the denial rates (and thus also verification rates) after a second mailer are equal across age categories (as is the case when age and denial status are statistically independent), youth registrants will still experience a disparate impact when youth registrants are more likely than older registrants to rely on the second mailer for verification.

44. A different problem is that Dr. White's decision to identify same-day registrants as "those having a status of "1ST VERIFICATION(PRIOR TO MAILING)" or "1ST VERIFICATION PENDING" during the early voting period"[21] is likely overinclusive since non-same-day registrants could also register during the early voting period; e.g., at the DMV.

45. Further, in his analysis at the election-county level using 26 years of age as the age cutoff, Dr. White states, "Among 573 combinations of election date and county, 150 were large and balanced enough for statistical analysis."[22] Similarly, in his analysis at the election-county level using 30 years of age as the age cutoff, Dr. White states, "Among 573 combinations of election

---

[20] *See* Bickel and Doksum, *supra* note 7, p. 217.
[21] White Report, p. 6.
[22] *Id.* note 19.

date and county, 156 were large and balanced enough for statistical analysis."[23] This restriction of the data is not statistically necessary.[24] Fisher's exact test, which Dr. White is using for these analyses, remains valid regardless of sample size or balance between categories. Indeed, as Dr. White notes in note 15 of his report, a virtue of Fisher's exact test is that it is suitable for situations with small sample size. Indeed, Fisher's exact test does not rely on any large-sample approximations and the test remains exact regardless of sample size.[25]

IV.   Conclusion

46. Dr. White's tests of independence of age and registration denial status among those same-day registrants who were sent a second mailer does not provide any direct evidence as to the causal effect of SB 747 relative to a baseline of another statutory regime governing address verification by mail of same-day registration.

47. Accordingly, Dr. White's claim that "[F]or the vast majority of the elections at the county level, and across all of North Carolina, from a statistical standpoint the second mailing had no significant effect on the denial rates of younger registrants" (p. 1) is not supported by the analysis in the White Report.

48. Dr. White's categorization of some results as being "adverse to" younger registrants or older registrants is, in some cases, misleading.

49. A more subtle, but ultimately more important, shortcoming of Dr. White's analysis is that he explicitly assumes that if denial rates after the second mailer are statistically indistinguishable

---

[23] *Id.* note 20.

[24] Spot checking these discarded county-election observations by testing the null hypothesis of independence between age and denial status using Fisher's exact test suggests that most, if not all, of the discarded county-election observations are consistent with the null hypothesis of independence between age and denial status.

[25] Agresti, *supra* note 5, p. 60.

between younger and older registrants, then there is no disparate impact on younger registrants. This is simply incorrect.

50. A correct interpretation of Dr. White's data shows that youth same-day registrants were more than 5 times more likely to rely on the second mailer for verification than were older registrants. The elimination of the possibility of verification on a second mailer under SB 747 would thus have a disparate impact on youth registrants.

51. Dr. White restricts his data analysis to a subset of county-elections that is not statistically necessary.

52. The results in the White Report, when properly interpreted, are consistent with the main points in my March 5, 2025 Expert Report and my March 20, 2025 Supplemental Expert Report.

53. Inspection of Table 3 in the White Report reveals that 2,797 of 6,521 same-day registrants who were verified on a second mailer were 26 years old or younger (42.89%). This is very similar to what I wrote in paragraph 44 of my Supplemental Expert Report: "Individuals under the age of 26 are the largest group of voters who had a second mailer sent or who rely on post-change-of-address forwarding. 44.0% of the individuals who were verified on a second mailer were youth voters… If the second mailer were not available, it is almost certain that these individuals would have failed verification and thus had their registration denied."

54. Nothing in the White Report causes me to revise the finding in my March 5, 2025 Expert Report and March 20, 2025 supplement to that report that SB 747 will likely result in disproportionate numbers of failed voter registration verifications for youth registrants—both relative to how those youth registrants would have fared in the pre-SB-747 two-mailer verification process and compared to how other age groups will likely fare under SB 747.

*   *   *

16

55. Pursuant to 28 U.S.C. § 1746(2), I declare under penalty of perjury that the foregoing is true and correct in substance and in fact to the best of my knowledge and belief.

Executed on: March 26, 2025

_____
Kevin M. Quinn, Ph.D.